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EFFECT OF DIFFERENT PACKAGING FILMS ON SHELF LIFE AND QUALITY OF PEAR FRUITS UNDER SUPER MARKET CONDITIONS

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ABSTRACT: Pear fruits cv. 'Patharnakh' were harvested at physiological mature stage, packed in paper moulded tray and tightly wrapped with different packaging films viz. Low density polyethylene (LDPE), High density polyethylene (HDPE), and Shrink. The film-packed fruits and control (without film packaging) were stored under super-market conditions i.e. 20-21°C and 85-90% RH and analyzed for various physico-chemical parameters after every 7 days interval. Shrink film proved to be most effective in extending the storage life of pear fruits up to three weeks and maintained superior quality as indicated by lower weight loss, desirable fruit firmness, total soluble solids, total sugars, acidity, and higher organoleptic score.

Keywords: *Pear, polymeric films, shelf-life, quality.*

In India pear is grown in warm humid sub-tropical plains and cold dry temperate regions occupying an area of 37,970 ha with an annual production of 3.34 lakh MT (Anon., 3). 'Patharnakh' is the leading cultivar of pear, predominantly grown in Punjab state. The harvesting of Patharnakh pear starts in the third weak of July and continues up to the end of August. Generally, this period coincides with heavy rainfall and high temperature, which interferes with post-harvest quality and marketability of the fruits and ultimately leads to glut and postharvest losses. In Punjab, these fruits are either marketed in gunny bags or loose or sometimes in wooden boxes, thus fetch lower prices in the markets. The role of packaging for horticultural produce seems to be still underestimated. Packaging of fresh fruits is essential in the whole distribution cycle, starting from producer to the final user.The basic principal of packaging technology is that once produce is placed in a package and sealed with polymeric films, an environment different from ambient conditions will be established inside the package such as high CO_2 and low oxygen which helps in maintaining the quality and increasing the shelf life (Hardenburg, 6 and Zora *et al,* 15). Hence the present investigation was planned to study the effect of polymeric films on the storage life and quality of pear fruits under super market condition i.e. at 20±1°C temperature.

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MATERIALS AND METHODS

The fruits of pear cv Patharnakh were harvested at physiological mature stage. The bruised and diseased fruits were sorted out, and only healthy and uniform sized fruits were selected for the study. Three types of packaging films viz Low density polyethylene film (LDPE 25 µ), High density polyethylene film (HDPE 20 µ) and Shrink film (10 µ) were used for packaging of pear fruits in paper moulded trays (22 cm × 13 cm). Pear fruits were packed in trays and tightly sealed with different packaging films. Thereafter, the packed fruits as well as control (non-packed) fruits were stored at 20-21°C and 85-90% RH (super-market conditions). The experiment consisted of 4 treatments and 5 storage intervals and laid out in completely randomized design with three replications for each treatment and each storage interval. The various physico-chemical parameters were recorded at weekly interval for four weeks. The physiological loss in weight (PLW) after each interval of storage was calculated by subtracting final weight from the initial weight of the fruits and expressed in per cent. The fruit firmness was measured with the help of a penetrometer (Model FT- 327, USA) using 8 mm stainless steel probe and

expressed in terms of kilogram force pressure (Kg force). The overall organoleptic rating of the fruits was done by a panel of five judges on the basis of external appearance of fruits, texture, taste, and flavor, making use of a 9-point Hedonic scale (Amerine *et al.,* 2). The total soluble solids (TSS) of the fruit juice were determined using a hand refractometer and expressed as per cent TSS after making the temperature correction at 20ºC. The total sugars and titratable acidity were estimated as per standard procedure (AOAC, 4).

RESULTS AND DISCUSSION

The physiological loss in weight (PLW) of fruits, in general, increased with the advancement of storage period rather slowly in the beginning but at a faster pace as the storage period advanced (Table 1). The shrink film packed fruits recorded the lowest mean PLW (3.50%). The unpacked fruits (control) showed the highest PLW (6.20%). The PLW of fruits packed in shrink film ranged between 1.20 to 6.30 per cent from 7 to 28 days of storage as compared to control whereas PLW ranged between 3.10 to 10.05 per cent during four weeks of storage. The fruits packed in different packaging films recorded lower weight loss, which is obvious due to role of films in checking rate of transpiration /respiration and maintaining higher humidity inside the wrappers (Ben Yehoshua, 5). The lower PLW has been reported in heat shrinkable cryovac film in Nagpur mandarin (Sonkar and Ladaniya, 12).

It is evident from the data that the fruit firmness, in general followed a declining trend commensurate with advancement in storage period (Table 1). The fruits packed in shrink film maintained the highest average firmness (5.92 kg force) closely followed by cling film (6.40 kg force) and also at all stages of storage intervals. The control fruits registered the lowest mean firmness (5.38 kg force). In case of shrink film packed fruits the decline in firmness was gradual, whereas in case of control fruits, the decline was found to be sharp. This reveals that shrink film packaging delays the softening process in pear fruits, and finally retained the desirable fruits firmness, which might be due to reduced transpiration loss and respiration activity and thus retained more turgidity of the cells as observed in pomegranate fruits (Nanda *et al,* 9)

The maximum sensory score (Table 1) was shown by fruits packed in shrink film (7.76). On the other hand, control fruits registered the minimum sensory score (6.38). The sensory score of shrink packed fruits increased gradually up to 21 days and thereafter declined, whereas, in control fruits, the sensory score increased up to 14 days of storage and thereafter declined at faster pace. The shrink film packed fruits were rated as very much desirable to moderately desirable after 3 and 4 weeks of storage as compared to control which were found acceptable up to 2 weeks of storage. The development of better sensory score in the shrink packs could be possibly due to creation of favourable gaseous atmosphere under congenial temperature (Heaton *et al,* 7).

The fruits packed in shrink film recorded maximum TSS content (12.11%). The control fruits recorded the lowest average TSS content (11.23%). It was further observed that in shrink film packed fruits the TSS content increased slowly and steadily up to 21 days (13.25%) and thereafter gradually declined after 28 days storage (10.95%). On the other hand, control fruits recorded a faster rise in TSS content up to 14 days (13.23%) and thereafter declined at a faster rate and recorded 9.15% TSS at the end of 4 weeks of storage (Table 2).

The fruits packed in shrink film (Table 2) recorded maximum total sugar content (8.36%). The control fruits recorded the lowest average total sugar content (7.80%). It was further observed that in shrink film packed fruits the total sugar content increased slowly and steadily up to 21 days (9.60%) and thereafter gradually declined after 28 days storage (7.50%). On the other hand, control fruits recorded a faster rise in total sugar content up to 14 days (9.50%) and thereafter declined at a faster rate and recorded 6.00% total sugar at the end of 4 weeks of storage. The delayed increase in TSS and total sugars over a longer period of time in shrink wrapped pear fruits might be attributed to delay in ethylene production and respiration rate of fruits (Abeles *et al,* 1). The increase in TSS/sugars during storage may possibly be due to breakdown of starch into sugars, as on complete hydrolysis of starch no

Table 1. Effect of different packaging films on PLW, firmness and sensory quality of pear fruits during storage under supermarket conditions.

Treatments	PLW (%)					Firmness (kg force)						Sensory quality					
	Storage interval (Days)					Storage interval (Days)						Storage interval (Days)					
	7	14	21	28	Mean	0	7	14	21	28	Mean	0	7	14	21	28	Mean
LDPE film	1.80	2.90	4.85	7.20	4.19	8.00	7.30	5.90	4.90	4.20	6.06	7.00	7.50	7.60	7.70	6.30	7.22
HDPE film	2.10	3.18	5.10	7.60	4.50	8.00	6.20	5.80	4.80	4.00	5.76	7.00	7.30	7.50	7.50	6.20	7.10
Shrink film	1.20	2.30	4.20	6.30	3.50	8.00	6.90	6.50	5.50	5.10	6.40	7.00	7.80	8.00	8.50	7.50	7.76
Control	3.10	4.85	6.80	10.05	6.20	8.00	6.00	5.10	4.30	3.50	5.38	7.00	7.90	8.00	5.50	3.50	6.38
Mean	2.05	3.31	5.24	7.79		8.00	6.60	5.83	4.88	4.20		7.00	7.63	7.78	7.30	5.88	

CD (P = 0.05)

Treatment =	0.20	0.18	0.15
Storage interval =	0.12	0.09	0.10
Treatment x Storage interval =	0.42	0.38	0.30

Table 2. Effect of different packaging films on PLW, firmness and sensory quality of pear fruits during storage under supermarket conditions.

Treatments	TSS (%)						Total sugars (%)						Acidity (%)					
	Storage interval (Days)						Storage interval (Days)						Storage interval (Days)					
	0	7	14	21	28	Mean	0	7	14	21	28	Mean	0	7	14	21	28	Mean
LDPE film	10.00	10.50	11.70	12..90	10.24	10.61	7.20	8.20	8.50	9.30	7.30	8.10	0.50	0.40	0.30	0.25	0.15	0.32
HDPE film	10.00	10..25	11.50	12.50	9.80	10.95	7.20	8.00	8.40	9.00	7.10	7.94	0.50	0.42	0.33	0.23	0.15	0.33
Shrink film	10.00	11.00	12.30	13.20	10.90	11.48	7.20	8.70	8.80	9.60	7.50	8.36	0.50	0.45	0.34	0.27	0.19	0.35
Control	10.00	11..30	13.00	10.20	9.10	10.58	7.20	8.90	9.50	7.40	6.00	7.80	0.50	0.40	0.30	0.22	0.16	0.32
Mean	10.00	10.75	12.13	11.97	10.01		7.20	8.45	8.80	8.83	7.04		0.50	0.42	0.32	0.24	0.16	

CD (P = 0.05)

Treatment =	0.11	0.10	NS
Storage interval =	0.08	0.06	0.05
Treatment x Storage interval =	0.24	0.20	NS

further increase in sugars occurs and subsequently a decline in these parameters is predictable as they along with other organic acids are primary substrate for respiration (Wills *et al.,* 14). Similar findings of increase in TSS and sugars of plum fruits during storage have been reported Mahajan *et al.,* (8).

The data revealed that acidity of pear fruits experienced a linear decline as the storage period advanced (Table 2). In shrink film packed fruits the acidity ranged from 0.50 to 0.19 per cent, and in control fruits, it ranged from 0.50 to 0.12 per cent from 7 to 28 days of storage. The decrease in titratable acids during storage may be attributed to utilization of organic acid in pyruvate decarboxylation reaction occuring during the ripening process of fruits (Pool *et al.* 10). Venkatesha and Reddy (13) reported that acidity decreased in guava fruit with increase in storage period, this might be due to the reason that polyethylene packaging arrested the ripening process by checking transpiration and respiration thereby retained higher level of acidity.

From the present study, it can by concluded that pear fruits packed in paper moulded tray with shrink can be marketed for 21 days with highly acceptable quality attributes under super market conditions (20-21ºC and 85-90% RH) .

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